OCR
A Level
Computer Science

H446 – Paper 1

Types of Operating System

Unit 2

Systems software and applications generation

2

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Objectives

- Describe distributed, embedded, multi-tasking, multi-user and real-time operating systems

- Describe BIOS, device drivers and virtual machines

Distributed Operating Systems

- We already know that the operating system manages communication with the hardware

- A distributed OS can coordinate the processing of a single job across multiple computers


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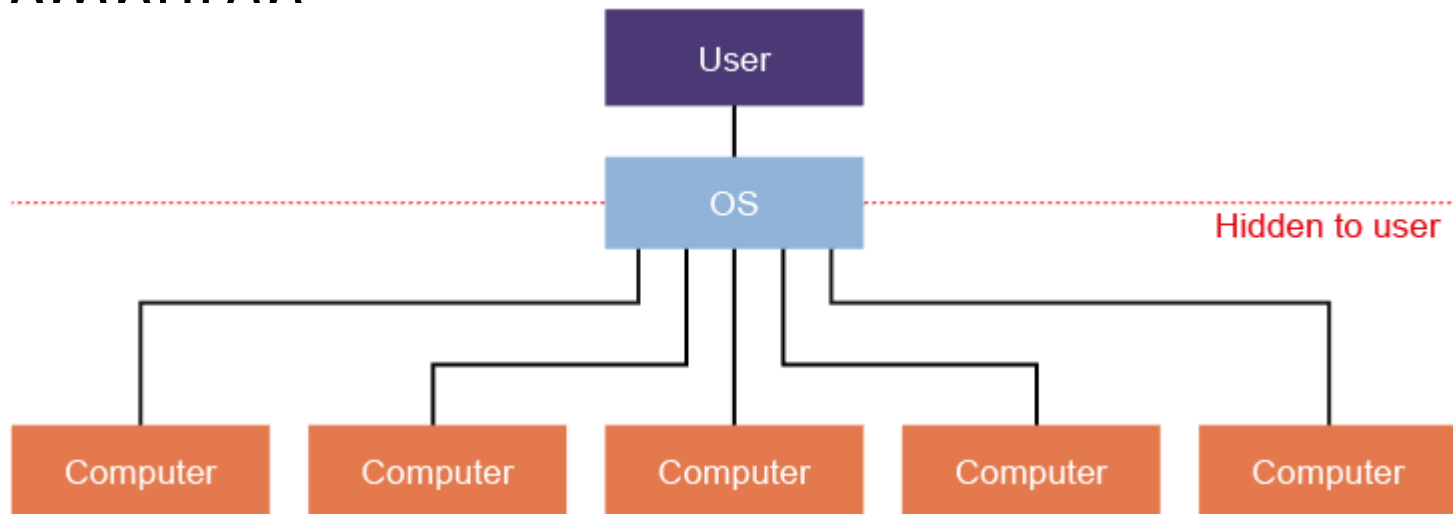
Distributed Operating Systems

- A program can be run by the user that uses data or resources from any other computer

  - Resources could include processor time, memory and I/O facilities

- The distribution of tasks is coordinated by the OS passing instructions between computers

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Distributed Operating Systems

- The user can access more computational power with the illusion of working with a single processor
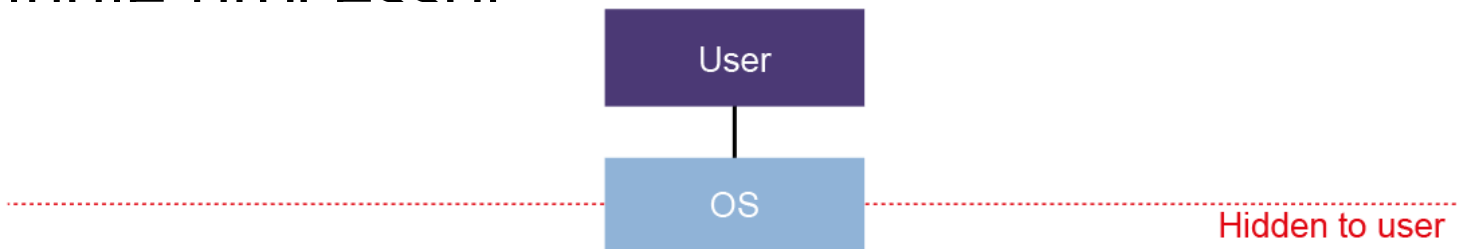
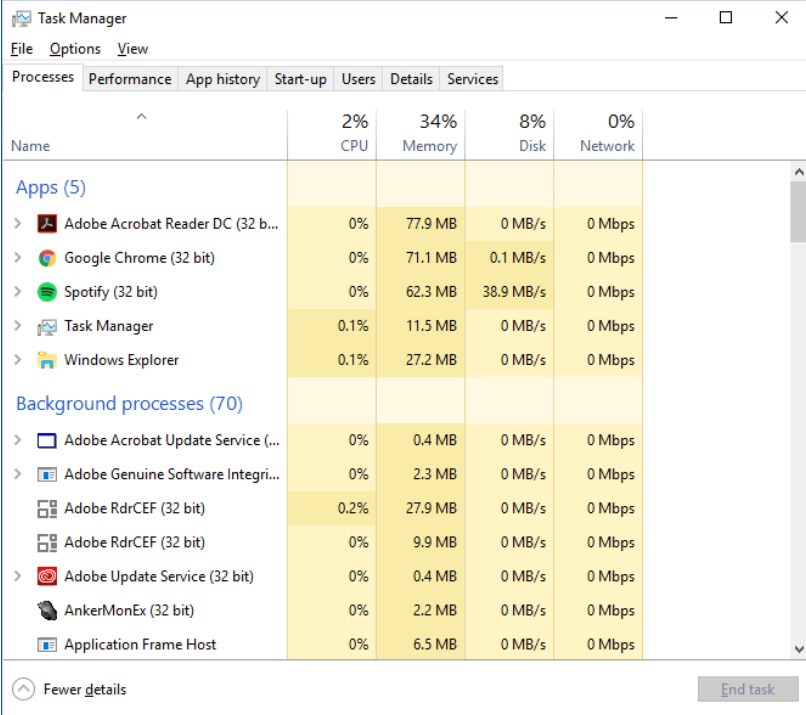- No need for training or writing programs differently

BUT

- The programmer has no control over the task distribution as this is entirely handled by the OS

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Multi-tasking system

- A single processor can appear to do more than one task simultaneously by scheduling processor time

Reading a document, browsing the web and listening to music at the same time
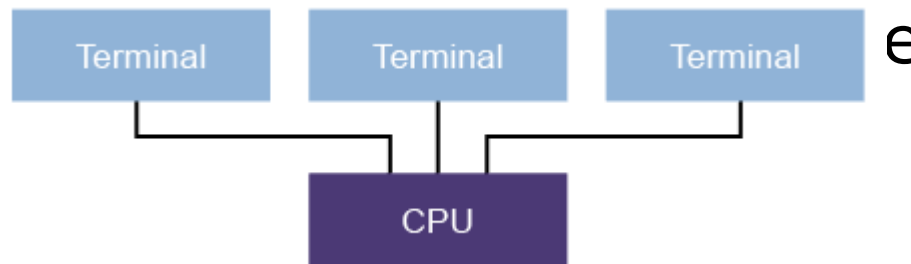
Other processes are also running in the background

Multi-user, multi-tasking system

- Some systems use a very powerful computer called a mainframe

  - These might be seen in universities or large businesses

- Lots of users with their own terminals access the mainframe's CPU and each gets a time slice

- Each terminal e processes

| Terminal | Terminal | Terminal |

CPU

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Mobile Operating Systems

- A smart phone is a computer with a multi-tasking Operating System

  - The iOS operating system on an iPhone for example, can run notes, calculator, to-do and phone apps at the same time

Mobile Operating Systems

- Mobile operating systems are linked to specific hardware

    - e.g. Android phones have different hardware to iOS phones

- A low level proprietary OS is used for handling the hardware and special features

    - Features include cellular connectivity and wi-fi

- Meanwhile, the main OS handles the user interface and running applications

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Open source operating system

- **Android** is an open source OS based on Linux and owned by Google

- It is used by all major device manufacturers including Samsung, Motorola, Dell, Ericsson

- It allows for major customisation

- A device manufacturer can fine-tune the OS to suit their devices, and add additional features or user interfaces to enhance the user experience

- The interface and the available apps can be a major selling point

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Worksheet 2

- Complete **Task 1** on the worksheet

Embedded Operating Systems

- Many devices in your home have an OS and run simple programs

  - How many examples can you think of?

Household devices

- The embedded OS has minimal features

- Application programs are held in ROM

- There is a limited amount of RAM

- The user interface is simple and minimal

  - What do you think the inputs and outputs would be for a household appliance?

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Real time Operating Systems

- Some operating systems must operate in real time

  - Must respond extremely quickly to inputs

  - May need to cope with many inputs simultaneously

- Real time Operating Systems are usually seen in safety-critical environments

- If a hardware component fails, the OS must have a failsafe to detect this and respond appropriately

- There is hardware redundancy - crucial components are duplicated in case one fails

Case study – Therac-25

- 1980s radiation therapy machine with a real time embedded operating system

  - Patients were treated for cancer through exposure to targeted beams of radiation

  - Programming errors meant the machine responded incorrectly to certain real time inputs

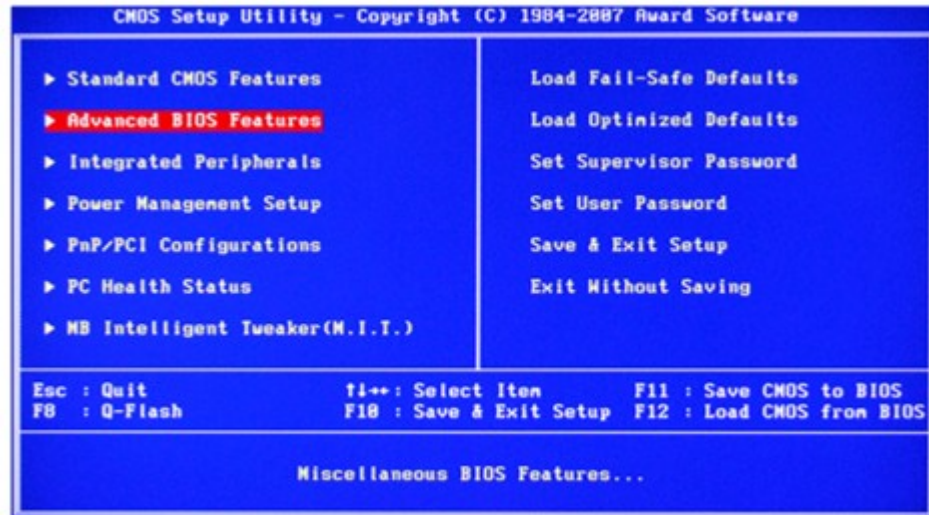 - Several people died as a result of accidentally being hit by massive radiation overdoses
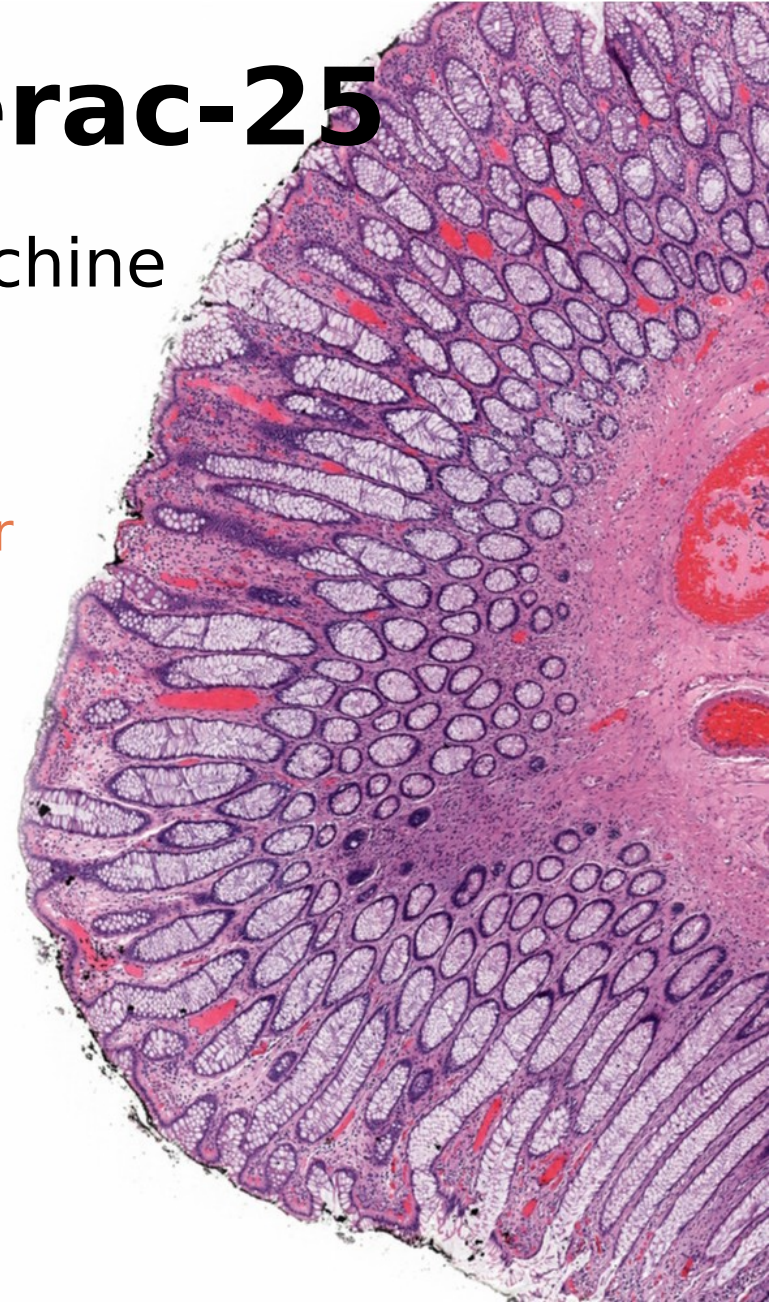
# Worksheet

- Complete **Task 2** on **Worksheet 2**

BIOS

- BIOS (Basic Input Output System) is stored in ROM

- The BIOS boots the computer at start-up

  - Initialises and tests hardware

  - Loads the Operating System into RAM
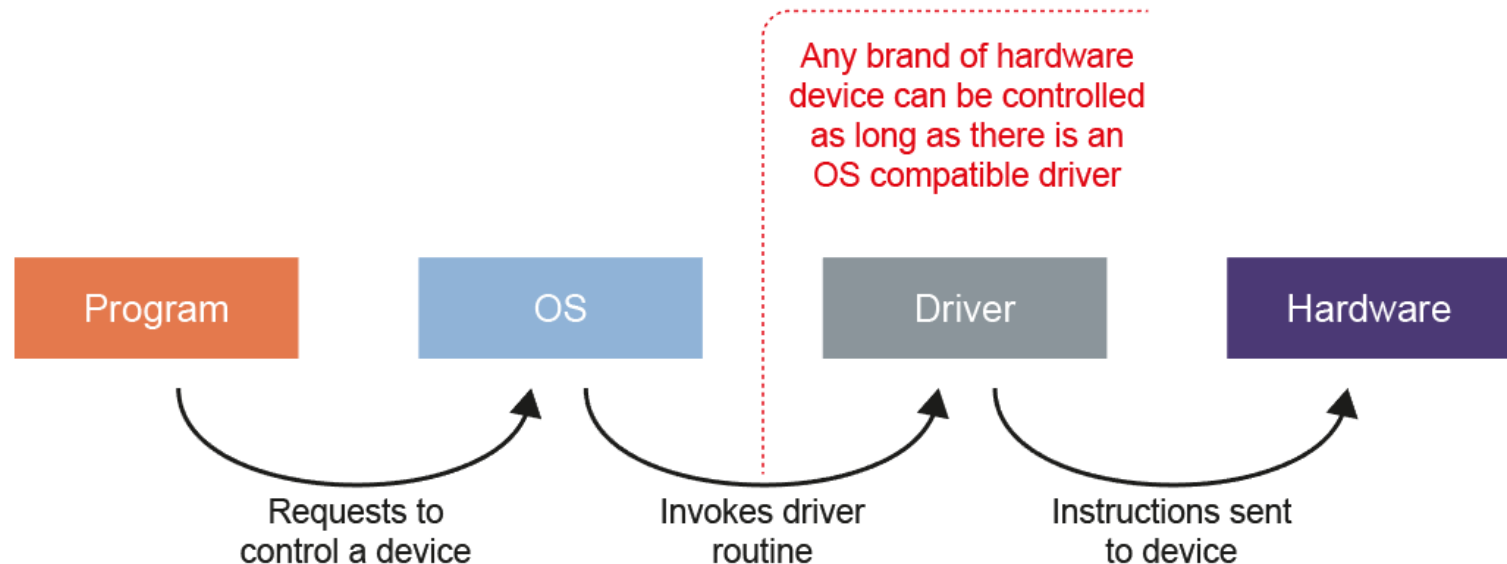

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Device drivers

- A driver is a program that provides an interface for the OS to interact with a device

- Drivers are hardware dependent and OS specific

  - Drivers are needed to allow the OS to control hardware
    devices   s card

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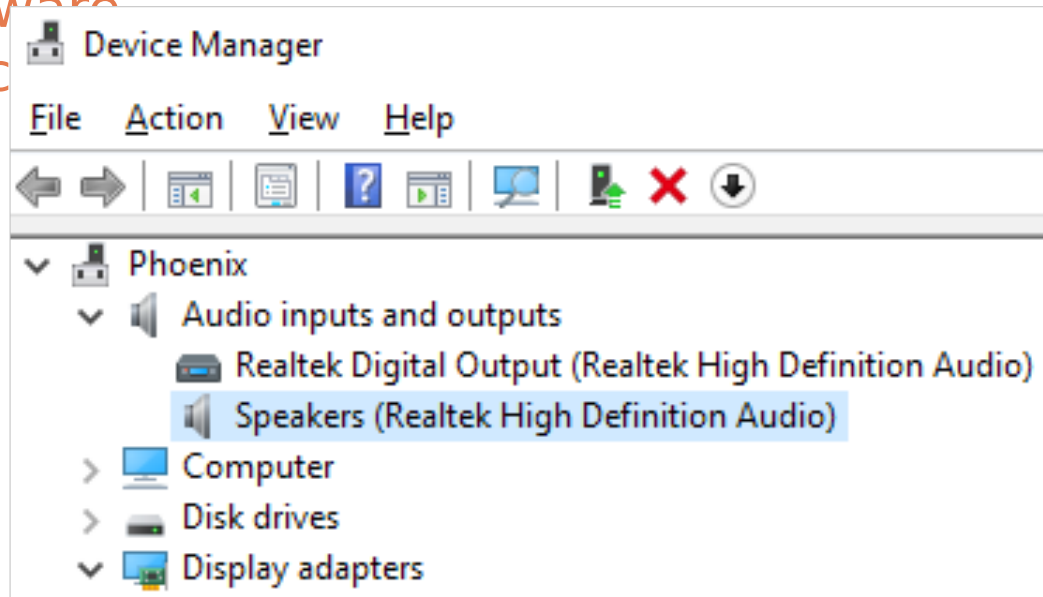
Device drivers

- The OS does not need to know the specifics of the hardware to be able to interact with it

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Virtual Machine

- Software is used to emulate a machine

- Can be used for running one OS inside another to emulate different hardware

- A virtual machine can execute intermediate code e.g. Java virtual machine executes Java byte code

  - The MAME virtual machine can emulate the hardware of old arcade machines so that their games can be played on a modern PC

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Plenary

- Operating systems can be

  - Distributed across multiple computers

  - Embedded into systems such as home appliances

  - Multi-tasking, for doing several things at once

  - Multi-user, to allow a mainframe's CPU to be shared

  - Real-time, to respond quickly when safety is critical

- The BIOS loads the operating system at boot time

- Device drivers allow the OS to control hardware

- Virtual machines are software emulating

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